

WHAT IS CLAIMED IS:

1. A method of manufacturing a semiconductor device comprising the steps of:

(a) forming a gate insulating film on a semiconductor substrate;

5 (b) forming a first polysilicon film containing n-type impurities on said gate insulating film;

(c) forming a second polysilicon film on said first polysilicon film, said second polysilicon film being a polysilicon film containing said impurities and having a concentration of said impurities lower than that of said first polysilicon film or a
10 non-doped polysilicon film;

(d) forming a gate electrode including said first and second polysilicon films on said gate insulating film by partly etching said first and second polysilicon films from the above of said second polysilicon film; and

(e) forming a sidewall on a side surface of said gate electrode after
15 accomplishing said step (d),

wherein the etching applied to said first and second polysilicon films in said step (d) forms an etched side surface of said first polysilicon film recessed compared with that of said second polysilicon film, thereby leaving a notch on said side surface of said gate electrode, and

20 said step (e) is performed in such a manner that said notch is filled with said sidewall.

2. The method of manufacturing a semiconductor device according to claim 1, wherein

25 said first polysilicon film is a doped polysilicon film containing said impurities,

and

said second polysilicon film is a doped polysilicon film containing said impurities or said non-doped polysilicon film.

5 3. The method of manufacturing a semiconductor device according to claim 1, wherein

said second polysilicon film is a doped polysilicon film containing said impurities or said non-doped polysilicon film,

said step (b) further comprises the steps of:

10 (b-1) forming a third polysilicon film on said gate insulating film; and

(b-2) ion-implanting said impurities into said third polysilicon film, and

said first polysilicon film is said third polysilicon film obtained after accomplishing said step (b-2),

wherein said manufacturing method further comprises the step of:

15 (f) applying an annealing treatment to the structure obtained after accomplishing said step (b), said step (f) being performed prior to said step (d).

4. The method of manufacturing a semiconductor device according to claim 1, wherein

20 said step (b) further comprises the steps of:

(b-1) forming a third polysilicon film on said gate insulating film;

(b-2) ion-implanting said impurities into a first region of said third polysilicon film with a first implanting amount; and

25 (b-3) ion-implanting said impurities into a second region of said third polysilicon film with a second implanting amount, said second implanting amount being

larger than said first implanting amount, and

said first polysilicon film is said third polysilicon film obtained after accomplishing said step (b-3),

wherein said gate electrode includes second and third gate electrodes,

5 in said step (d), said second and third gate electrodes are formed on said gate insulating film by partly etching said first and second regions of said third polysilicon film, said second gate electrode including said first region of said third polysilicon film and said second polysilicon film and said third gate electrode including said second region of said third polysilicon film and said second polysilicon film, and

10 said notch formed on the side surface of said second gate electrode is smaller than said notch formed on the side surface of said third gate electrode.

5. The method of manufacturing a semiconductor device according to claim 4, wherein

15 said second polysilicon film is a doped polysilicon film containing said impurities or said non-doped polysilicon film, and

said manufacturing method further comprises the step of:

(f) applying an annealing treatment to the structure obtained after accomplishing said step (b), said step (f) being performed prior to said step (d).

20